Impact of Macroeconomic Indicators on Carbon Emission in BRICS Countries

A Synopsis

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1. Introduction

Industrialization is proven to grow the world economy but disrupts environmental sustainability. Industrialization affects the environment, such as air pollution and global warming through carbon dioxide (CO2) emissions (Tong et al., 2020). Azwar (2019) stated that the increase in CO2 emissions is in line with industrialization. Both developed and developing countries face this condition, Bashir et al. (2019) mentioned that economies should focus on maintaining economic growth by minimizing environmental damage.

BRICS has abundant natural wealth and use the natural resources in economic activities to achieve economic development (Prawoto & Basuki, 2020). Ideally, economic growth is balanced with environmental preservation and renewable and non-renewable resources. Several previous studies highlighted economic development but did not pay attention to the balance of nature. Chontanawat (2020) found cointegration and causality between CO2 emissions, energy consumption, and ASEAN economic performance indicating environmental damage in ASEAN countries.

Hdom and Fuinhas (2020) showed the negative impact of GDP, renewables, and hydropower on increasing CO2 emissions in Brazil. A study in Indonesia by Azwar (2019) showed a positive effect of economic growth on CO2 emissions, especially heat production and electricity. Tong et al. (2020) identified the relationship between CO2 emissions and economic growth in E7 countries (Brazil, India, Indonesia, Mexico, People's Republic of China, Russia, and Turkey), showing no cointegration between energy consumption, CO2 emissions, and economic growth in Indonesia, the People's Republic of China, Mexico, and Turkey. In line with a study by Shahbaz et al.

(2020) in the UK, energy consumption and financial development contribute to environmental pollution, but CO2 emissions can still be controlled through research and development expenditure. The progress of the economic

development sector is ideally balanced with the efficiency of natural resources in the industrial sector because the challenges ahead will be more serious along with the increase in the use of power generation and transportation.

The BRICS is serious about managing environmentally friendly industries and is committed to reducing CO2 emissions. Environmental sustainability has now become an international concern. Improving the quality of human life through progressive development requires a better environmental quality.

There are still few studies analysing the effect of economic activity as proxied by macroeconomic indicators with the risk of increasing CO2 emissions. Hence, this study examined GDP, broad money, foreign direct investment, manufacturing value-added, and international trade on CO2 emissions in BRICS from 2005 to 2021. This study contributed to the literature in estimating impact of macroeconomic indicators on CO2 emissions in BRICS with long-term and short-term analysis affecting policies in a long-term low-emissions economic development strategy.

2. Literature review

Growth is a progressive phenomenon that evolves through combination of factors (natural, human and technological) within specified periods. The dire need to grow the economy increases economic activities in countries of the world. Increase in the volume of economic activities had been argued as the causes of environmental hazards (Adu and Denkyirah, 2017).

Economic growth is seen to be facilitated through industrialization and globalization. Industrialization serves as the economic engine for growth and development. Industrialization and globalization are enhanced through technology and increased energy consumption. The increase in economic growth will induce global warming. Countries in West Africa are gradually shifting from the agricultural-based economy to attaining high level of growth. The establishment of industries by foreign entrepreneurs coupled with indigenous ones has made West African countries "pollution haven" due to weak environmental protection laws.

In unravelling the debate whether economic growth causes disruption of the environment, Kuznets (1995) hypothesized that as per capita increases, income inequality reaches maximum and decreases in line with diminishing laws of returns. Increase in income is necessitated by economic growth and desire for pleasurable life. Studies from environmental Kuznets' curve indicates that emerging economies such as West African countries will face degradations in the environment at the onset of economic development (Grossman and Krueger, 1995).

Oil mining in Nigeria (Niger–Delta region) has drastically altered the ecosystem resulting to massive environmental pollution of the land, sea and air. The pollution caused by oil spillage, pipelines vandalism, gas flaring and local refineries is overwhelming and catastrophic to human and environmental resources.

3. Objectives

1. To identify the impact of macroeconomic indicators on carbon emission in short run.
2. To identify the impact of macroeconomic indicators on carbon emission in long run.

4. Hypotheses

Hypothesis 1:

$H_0 1$. Macroeconomic indicators do not show significant impact on emissions of carbon in the selected study areas in the short run.

$H_1 1$. Macroeconomic indicators do show significant impact on emissions of carbon in the selected study areas in the short run.

Hypothesis 2:

$H_0 2$. Macroeconomic indicators do not show significant impact on emissions of carbon in the selected study areas in the long run.

$H_2 2$. Macroeconomic indicators do show significant impact on emissions of carbon in the selected study areas in the long run.

5. Methodology

5.1 Data and Sample:

The research employed secondary panel data obtained online through World Bank Group website and the Central Bank of the selected study countries covering the period 2005–2021. The selected panel sample countries included in this study are BRICS (Brazil, Russia, India, China, South Africa).

5.2Variables and Econometric techniques:

5.2.1 Dependent variable:

CO2 emissions: Carbon dioxide or simply carbon emissions

5.2.2 Independent variable:

GDP broad money: Broad money, % of GDP

Foreign direct investment: Foreign direct investment, net inflows, % of GDP

Manufacturing value-added: Manufacturing value-added, constant 2010 US$

International trade: Exports of goods and services, constant 2010 US$.

5.2.3 Econometric technique:

This study used the Autoregressive Distributed Lag-Error Correction Model (ARDL-ECM) in panel and individual settings, where estimates were made in the short and long term. ARDL is a long-term econometric estimation approach to seeing the effect of variables by getting the effect value consistently through the lag of the dependent and independent variables.

6. Limitation and scope of the study

The study is limited to the BRICS countries from 2005-2021.

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